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IS MASS STILL A VALID PRINCIPLE OF WAR ON TODAY'S BATTLEFIELD?

by

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The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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This research examined the principle of mass in relation to today's military capabilities and tomorrow's potential to determine if mass, as it is presently defined, still has a valid function to fulfill on the battlefield? The author determined the principle of mass is a dynamic concept that changes in definition and in application as technology advances. Where once it meant overwhelming the enemy by sheer weight of arms at a singled point on the battlefield, it has come to mean overwhelming the enemy through the concentration of the effects of combat power at a decisive point and time. The simultaneity of strikes against a multiple array of targets in Desert Storm provides an indication of how the concept of mass will be defined in its next iteration.

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INTRODUCTION

The principles of war, as currently adopted by the United States Armed Forces, represent an analytical framework for arriving at critical decisions at the tactical, operational, and strategic levels of warfare. Although the debate about the efficacy of the principles of war has raged since Carl von Clausewitz first tried to elucidate the enduring truths of warfare, the principles are the foundation upon which the U.S. joint warfare doctrine is built. Writers of the joint warfare doctrine consider the principles of war to "represent the best efforts of military thinkers to identify those aspects of warfare that are universally true and relevant."[1] The writers are quick to caveat, however, that the principles of war should be applied broadly and should not be accepted in an immutable or dogmatic fashion.[2]

U.S. joint warfare doctrine lists nine principles of war: objective, offensive, mass, economy of force, maneuver, unity of command, security, surprise, and simplicity.[3] Each principle is important to mission success, but objective is considered the most important because it provides the aim or purpose of the warfighting effort--it is the "connecting link which, alone, can impart coherence to war. . . . Without the objective, all other principles are pointless."[4] In combat operations, the ultimate objective is the destruction of the enemy armed forces' capabilities and will to fight.[5] Thus, objective represents the guiding principle in warfare; and its most vital element becomes the principle of mass, for it emphasizes bringing the effects of overwhelming combat power to bear at the decisive time and place in order to achieve the objective.[6] The purpose of this research paper is to examine whether mass is still a valid principle on today's battlefield, and, if so, is it being reshaped by doctrinal thinkers as they view the concept in relation to a revolution in military affairs (RMA), information age warfare, and the projected direction of future war?

At the Battle of Leuctra, in 371 B.C.E., Theban General Epaninondas' army was outnumbered by Spartan King Cleombrot by four thousand troops. Rejecting the prevailing

tactic of the day, which would have required him to disperse his outnumbered troops equally across the entire width of the battlefield, Epaninondas compensated for the disparity in strength by massing his forces. The Theban general weighted his left flank with the preponderance of his forces, while he maintained an economy of force in the center and on the right side of his line. Through this innovative tactic, he managed to gain overwhelming strength against his numerically superior foe at the decisive point on the battlefield. His gamble was successful: the strong Theban left managed to break the Spartan phalanx and rout Cleombrot's forces. Epaninondas is credited with having been the first military leader in history to apply the principle of mass--a principle which has been the decisive factor in nearly all battles up to the present day.[7]

Throughout the history of warfare, mass has been a dynamic principle of war. As weapons, operational concepts, tactics, strategies, and technological capabilities have changed throughout the centuries, so, too, have the great captains of history--from Alexander to Napoleon--exploited new capabilities to reshape and apply the concepts governing the principle of mass. Today, technology in the form of microelectronics, miniaturization, and space-based surveillance and communications systems has caused some military thinkers to consider that it is time "to move beyond the old Jominian-Clausewitzian categories of the linear battle, executed in time-phased sequences, with the levels of war fastidiously differentiated."[8] By reshaping the concept of mass, a transitional link can be found that will allow for the exploitation of new ideas in multi-dimensional warfare.

MASS AND THE OPERATIONAL ART

"The essence of operational art lies in being able to mass effects against the enemy's main source of power--his center of gravity."[9] Since the enemy center of gravity is the characteristic, capability, or location from which he derives his strength, his freedom of action, or his will to fight, it is normally not possible to attack it directly. Therefore, the commander generally selects decisive points that, through their seizure, destruction, or retention, will

allow him to eventually defeat the enemy's hub of power.[10] At the operational level of war, the combatant commander applies the principle of mass through the synchronization of all elements of combat power in order to accomplish these objectives. Synchronization is the military art of "arranging activities in time and space to mass at the decisive point."[11]

On a fluid, highly-mobile, all-weather, and "empty" future battlefield, a sophisticated enemy who is suitably armed with an array of niche technologies may be capable of disrupting or deflecting attempts to mass effects against him at a decisive point. As a result, the combatant commander may find that instead of striving to mass combat effects against the enemy in a phased sequence, he may achieve mass through a "holistic" approach in which synchronization, simultaneity, and depth are combined in a manner that will "bring force to bear on the opponent's entire structure in a near simultaneous manner."[12] By dispersing the effects of combat power in simultaneous strikes against multiple operational objectives throughout the depth and space of the theater of operations, the combatant commander attempts to overwhelm the enemy's command, control, communication, computer, and intelligence (C4I) systems. The intended result is to blind, mute, confuse, and demoralize the enemy to such an extent that he is incapable of reacting effectively to any one particular threat launched against him.

THE REVOLUTION IN MILITARY AFFAIRS

For two millennia, warfare remained essentially unchanged. It centered on mass and concentration of forces. Soviet military theorist G. S. Isserson termed the style of warfare as the "strategy of the single point."[13] Armies maneuvered in densely packed formations and fought on very narrow fronts with only limited linear extension or depth. The aim was to engage the enemy in a single, decisive battle of annihilation. Planning and execution extended only to winning the decisive battle. Operational art was not practiced because there was no requirement to integrate "temporally and spatially distributed operations into one coherent whole."[14] Author Martin van Crevald contends that only by considering the impact

technology has on warfare is it possible to comprehend the speed of its development. Van Creveld's assertion illuminates why warfare doctrine remained virtually static for 2,000 years, yet, today, doctrinal concepts are in a constant state of flux.

> . . . war is completely permeated by technology and governed by it. . . . planning, preparation, execution, and evaluation; operations and intelligence and organization and missions; command and leadership and strategy and tactics; even the conceptual frameworks employed by our brains in order to think about war and its conduct--not one of these is immune to the impact that technology has had and does have and always will have.[15]

The impetus for recent changes in operational thinking and design is a result of an RMA. Soviet writers such as Marshal N.V. Ogarkov began writing about the RMA in the late1970s. He and his colleagues are credited with identifying many of the operational and tactical elements now being discussed in the RMA. Ogarkov formulated his thoughts as he wrestled with geo-political conditions of the European Theater of War and the strategic problem of how to conduct decisive operations against a heavily armored and mechanized foe who had theater nuclear assets in overwatch. He concluded that tempo and striking power were the crucial elements in solving the problem. What he feared was that given U.S. technical superiority over the then Soviet Union, America would manage to weave together the elements of an RMA--technologies, evolving military systems, operational innovation, and organizational adaptation--into "a whole more powerful than its parts."[16] Judging by the U.S.-led coalition's success in Desert Storm, Ogarkov's concerns were well founded. During the Gulf War, the United States was able to "conduct tightly synchronized, highly integrated joint operations across the extent and throughout the depth of the theater, striking both the enemy's strategic centers of gravity and the enemy's operational forces, in order to produce decisive results."[17]

An RMA results when ideas and inventions combine in such a fashion as to create "dramatic and decisive change; permanent, fundamental, and rapid."[18] Most theorists agree that until the present there have been only two true military revolutions: the first occurring in

conjunction with the rise of agricultural society and the second as a result of the industrial revolution.

Propelling the new RMA is information. Developed nations have moved from the industrial age to the information age. "Nothing rivals the pace or intensity of modern warfare, except perhaps the corresponding requirement to acquire data, process and assimilate information, and then disseminate decisions resulting from that process to subordinate forces."[19] The volume and precision of fire, integrative technology, and the invisibility and detectability of the Gulf War battlefield dramatically demonstrate this revolutionary shift in warfare. Microelectronics make it possible to "integrate incoming data and to transmit a more complex picture back to the field commanders for action."[20] Reconnaissance, surveillance, and target acquisition and C41 capabilities have lifted the shroud of fog and pierced the blackness of night. Through the advent of seismic, thermal, magnetic, and acoustic devices, the commander can see deeper into the battlefield and can more precisely define targets.[21]

The massing of troops and weapons at the decisive place and time has been the deciding factor in most battles and campaigns for centuries. In the 20th century, the ascendancy of instant communications, satellite surveillance, airpower, and the increasing range and accuracy of indirect fire weapons, including conventional and nuclear missiles, have made the massing of troops and equipment on the battlefield a vulnerability rather than a strength. In light of these technological developments, the principle of mass has evolved to mean the massing of effects of combat power at the decisive time and place. Massed combat power is now, by necessity, short-lived with rapid dispersal required if the enemy is to be denied a lucrative target.[22]

Information Age Warfare

In the next 20 years, "information technology is expected to make a thousandfold advance."[23] Any framework for the discussion of the application of the principle of mass on the 21st century battlefield, then, must consider how information technology will alter military

tactics, doctrine, and force structure. "Information will allow the conduct of future full-dimensional operations by informing units--perhaps even enemy units, to convince them to surrender--of the full effect of all actions throughout the depth, height, width, and time of the battlespace."[24] The three levels of warfare--tactical, operational, and strategic--"as distinct loci of command functional responsibilities, will be spaced out of existence."[25]

Information age warfare may be defined as "the competition of opposing information systems."[26] Its objective is to "gain an information advantage--measured in time and space--to enable our forces to quickly overwhelm the enemy force."[27] The definition and the objective of information age warfare encompasses both an offensive and defensive mind-set. The intent is to protect one's own information system while disrupting hostile information systems. "One goal in the joint campaign is to exploit the information differential--that is the superior access to and ability to effectively employ information in the strategic, operational, and tactical situation . . ."[28]

In the Gulf War, the United States used technology to design high-tempo, complex, parallel, and simultaneous operations that

> overwhelmed the enemy's ability to respond. This advantage was built not only on advanced sensors and smart weapons, but perhaps more importantly on forces supported by modern C4I systems and technologies that allowed the United States to collapse previous spatial and temporal constraints. . . . The number and tempo of these simultaneous parallel operations by themselves produce saturation effects that simply overloaded the enemy's command system . . .[29]

Colonel John Boyd's observation-orientation-decision-action (OODA) loop is premised on the idea that if a commander can cycle through his own OODA loop quickly while disrupting the enemy's OODA loop, he can mass his combat effects against the enemy before the enemy can react. Through timing and tempo the commander attempts to exploit his own capabilities while limiting those of the enemy. If properly timed and orchestrated, the commander can "dominate the action, remain unpredictable and operate beyond the enemy's ability to react."[30]

To control tempo requires that the commander have nearly real time information available concerning his own force locations and capabilities, as well as those of the enemy. Therefore, information warfare facilitates the principle of agility. Agility is not about speed, per se, but rather timeliness. If the commander can think, plan, communicate, and act in a more timely fashion than the enemy can effectively react, then he can control the initiative and tempo of the operation. "Agility has different perspectives based on the level of war . . . .At each of these levels, operations on land and sea, undersea, and in the air and space must achieve a synchronized timing and tempo that overmatch the enemy."[31]

Computerized War

With the advent of the computer, modern society transitioned from a military-industrial complex to a military-civilian-computer complex. Computers are now used to manage everything from society's machinery and infrastructure to the military's battle space.[32] The result of this new technology has been to vastly increase "the amount of information needed to run any military unit, make any decision, carry out any mission, conduct an operation, campaign, or war. . . . Thus technology gave birth to complexity, complexity to an extraordinary requirement for information, . . ."[33] As amazing as the past half-century has been in the advancement of computerized systems, artificial intelligence applications are still in the embryonic stage of development. In the next century robotics, enhanced stealth technology, improved optics and electronics, propulsion, and power generation will mature as warfighting tools.[34] While the computer has made it possible for the commander to plan and execute the synchronized, simultaneous effects of combat power against the enemy's entire structure, dependency on the computer has also made the commander vulnerable. Not only are the computer systems vulnerable to hackers and susceptible to interception of emissions, their sheer complexity requires constant maintenance by highly skilled technicians. "Commanders must face reality--any computer-controlled system can be affected. The concept of an impenetrable system is a mirage."[35]

Space Technology

Space-based systems proved their value in Desert Storm. As coalition forces maneuvered on the desert below, satellites in orbit above kept commanders informed of everything from location on the ground to weather to enemy dispositions. Communications, navigation, reconnaissance, and command and control were all linked to satellites. Via satellite, the world watched the Gulf War on television screens. In many ways, the viewing public knew more about what was happening within the theater of operations than did the troops who were fighting the conflict.

In a 1988 space policy letter, the U.S. Air Force projected that

> spacepower will one day be as decisive as airpower. . . . Space capabilities allow us to excel at some of the intangibles of war, such as *assured command and control* on a local tactical battlefield and throughout a theater, *timing and synchronization* in all operational environments, and *dictating the timing and tempo of combat operations*.[36]

What spacepower promises is the application of the principle of mass through the strategic concentration of force "at the appropriate time without the collocation of assets, i.e., energy can be focused from vastly separated sources to a single point for force application or data transmission."[37]

FUTURE WAR

In their writings, Alvin and Heidi Toffler divide the world's nations into three tiers: first wave nations are those countries that are scratching for the essentials of survival; second wave nations incorporate those states that still have industrial-based economies; and, third wave nations are those countries that are high-technology oriented and information-based. The divergent national interests of these dissimilar states will collide for unfamiliar reasons.[38] "What many foreign policy pundits still fail to appreciate is that when systems are 'far from equilibrium' they behave in bizarre ways that violate the usual rules. They become nonlinear--which means that small inputs can trigger gigantic effects."[39] It is against this chaotic backdrop that the U.S. military must prepare for conflict in the next century. The dissolution

of the Soviet Union at the beginning of this decade ended forty years of a Cold War in which the United States and the USSR, as the chief protagonists, designed strategic, operational, and tactical concepts to defeat the other in a conventional--and if needed, nuclear--war on the continent of Europe. Earl H. Tilford, Jr., Director of Research at the Strategic Studies Institute, likened the end of the Cold War and the Gulf War as the "bookend" of a second Hundred Years War that began with the Franco-Prussian War in 1870-71.[40]

Fourth Generation Warfare

Theorists suggest that the history of warfare can be viewed as generational in nature. The first three generations were massed manpower, massed firepower, and maneuver warfare, respectively. The fourth generation of warfare is centered on information.[41] What information systems offer the operational commander are links to computer networks, to satellites, to precision guided weapons, and to digital command and control systems. With these tools the commander can develop synergy, a concept in which he employs air, land, sea, space, and special operations forces in multidimensional combinations of forces and actions to achieve concentration.[42]

The end of the Cold War, the RMA, and the cuts in defense budgets have compelled the U.S. Armed Forces to reassess how they are organized, supplied, managed, and employed. To meet this challenge, the U.S. Army has changed from a forward-deployed army to a power-projection army in which rapid deployment, sustainability, and precision strikes are emphasized in order to mass the effect of its combat power at the critical time and place.[43] The U.S. Navy and Marine Corps, in their joint Operational Maneuver from the Sea concept, are coupling doctrine with technological advances to expand the principles of maneuver warfare doctrine to the projection of maritime power in littoral regions. The concept envisions using new technologies to allow assault forces to be physically dispersed for simultaneous power projection at multiple decisive points.[44] The U.S. Air Force, in its Global

Reach-Global Power concept, is emphasizing power projection in both air and space dimensions.[45]

The nature of the future battlefield is likely to be one of integrated joint and combined operations in which the principle of mass is attained through the integration and synchronization of "redundant, multiservice warfighting systems in simultaneous attacks on the enemy throughout his entire depth and in the space above him as well."[46] The emerging forms of weaponry may include pulsed-power rail guns, high-power microwave projectiles, optical munitions, acoustic beams, annihilation energy, robotics machine guns, unmanned ground vehicles, and laser weaponry.[47] Combat formations will be smaller, yet through advanced indirect- and direct-fire weapon systems, they will be able to dominate larger battle areas. Lethal, precision-guided munitions will be launched from greater distances. "Aided by enhanced surveillance capabilities in the form of unmanned aerial vehicles, airborne radar, and satellites, fewer forces are needed to concentrate the effects of combat power against the enemy."[48] To reduce the vulnerability of friendly troops, units may be restructured into light and heavy teams. Highly-mobile light teams, armed with cellular phones, laser designators, digital telemetry, and cameras, will conduct independent searches for the enemy C4I, logistics centers, and troop locations throughout the battle area. Once located, the enemy locations will be targeted immediately with massed, indirect-fire weapons.[49]

Shifting Enemy

The spectrum of future conflicts will vary from operations other than war to general war. "Battle command, extended battle space, simultaneity, spectrum supremacy, and the rules of war" will be the dominating characteristics of the battlefield.[50] The extended battle space will involve fewer, more dispersed soldiers giving the impression of an "empty" battlefield. "Commanders will seek to avoid linear actions, close-in combat, stable fronts, and long operational pauses . . . [and they] may place greater emphasis on operational-and/or tactical-level raids--combined with deep strike means--to break up an enemy's formations from

within."[51] Battle command will include both "hierarchical and internetted, nonhierarchical" structures.[52] "Combinations of centralized and decentralized means will result in military units being able to decide and act at a tempo enemies simply cannot equal."[53]

Van Creveld suggests that when belligerents share similar technologies their "capabilities, methods and missions are likely to converge," causing the pattern of their war to be conducted in a predictable fashion.[54] Given the dangerous, yet understood, nature of the Cold War, operational commanders may develop a certain nostalgia for the old days as they try to discern the type of enemy they may face in the future. With no military peer competitor, the United States is unlikely to experience a direct attack. What is likely is that U.S. regional interests will be challenged by other nations, which may provoke a military response. The type of enemy the United States could face may be dismounted infantry based armies with rudimentary combined arms capabilities, or armor-mechanized-based armies that have effective weapons integration, combined arms capabilities, and hierarchical command structures. At the top end are complex, technically- and tactically-advanced armies that are continually adding to their high-technology equipment, precision munitions, and smart weapons.[55]

When confronted by a technologically superior foe such as the United States, infantry-based nations will probably eschew conventional warfare in favor of an unconventional strategy focused on the population. Their aim will be to avoid their high-tech opponent in battle, while a protracted war of attrition is carried out.[56] It is more difficult to predict what strategy armor-heavy armies will adopt. Given an irrational political leader or religious, political, or ethnic convictions, or fueled by economic desires, it is conceivable that such a nation would seek a conventional confrontation with a superpower. Complex, adaptive adversaries can be expected to engage in advanced technology warfare against the United States providing they have some particular edge such as strong public support, favorable

world opinion, a solid coalition, niche technologies superior to our own, or a combination of these elements.

As the United States learned in Vietnam and the Soviets in Afghanistan, overwhelming superiority in technologically-advanced combat power does not necessarily translate into victory against a rudimentary foe. Bringing the effects of combat power to bear at decisive points is difficult against an elusive enemy who has a fluid center of gravity.

> Opponents at the low end of the spectrum tend to operate in widely dispersed fashion and emit a limited electronic signature, thus complicating targeting. Their organization is often cellular, making decapitation difficult. If they are insurgents, they intermingle with the population, eroding the effectiveness and morality of stand-off strikes. If they are terrorists, they need only succeed in a limited number of military missions to attain desired psychological objectives.[57]

"In this sort of war [guerrilla or low-intensity conflict], obtaining information about the enemy and controlling the political debate are essential."[58]

At the mid-intensity conflict level, such as a regional war, a technologically inferior enemy can compensate by buying sophisticated conventional (and perhaps nuclear) weapons. They can also buy off-the-shelf technology and hire the expertise to operate these systems. And while the computer provides the U.S. military with an exceptional ability to integrate C4I and logistics functions into a synergistic whole, it also creates our most critical vulnerability. America does not have a monopoly on computer technology. "Ingenious hackers could destroy U.S. computers with a well placed virus."[59]

Space is another area in which the U.S. does not have a monopoly. Other countries are exploiting satellite technology for economic and military reasons. At all three levels of warfare, the trend toward using satellite links for exercising command and control functions presently gives the U.S. military a significant advantage in the design and execution of campaign plans, but other countries have a space vision, as well; and they are entering that dimension in increasing numbers. One key concern is the proliferation of satellite-mounted

remote sensors that give the enemy additional capability to conduct surveillance on U.S forces as they deploy troops and weapons systems.

> This requirement to execute large land operations while under observation (close, deep and rear) is not standard US military practice. . . . The Army's largest operations in recent years against significant opposition, *Desert Shield, Desert Storm and Just Cause*, implicitly assumed that surprise was achievable because observation by the enemy was impossible beyond his own front lines.[60]

Future U.S. military planning must incorporate an assumption that at the least "commercial archives of 5- to10-meter imagery will be available to future adversaries who preplan military actions within their own region."[61] As potential adversaries improve their satellite surveillance capabilities or buy imagery from other nations, commanders may find themselves less able to achieve the principle of surprise. Although lack of surprise will not necessarily negate a commander's ability to mass the effects of combat power at decisive points, it will degrade his ability to shift the balance of his combat power in preparation for such a strike.

Cautions and Considerations

During the Cold War, weapons of mass destruction guided much of the U.S. military's thinking as planners wrestled with how best to apply the concept of mass in a nuclear age in which concentration of troops and equipment for even brief periods could result in catastrophic losses. As a result, the battlefield became more dispersed, the range of conventional weapons was increased, and fire and maneuver became essential. The ability to mass was contingent upon the ability to coalesce combat power rapidly at a decisive point. Today, concern about the proliferation of chemical, nuclear, and biological weapons is no less intense, but the worry is centered more on security issues and fears that weapons of mass destruction will be used by rogue states or terrorist groups for political purposes rather than for decisive use on the battlefield.[62] Conceivably, a weapon of mass destruction could knock out critical command and control nodes and impinge on the ability to mass combat effects. These weapons remain a vital concern for operational planners.

Joint force commanders apply force in an integrated and synchronized manner to shock, disrupt, and defeat the enemy.[63] In examining the concept of integration, van Creveld asserts that a paradoxical relationship exists between the drive toward integration of functions and "the declining effectiveness of each individual element."[64] He also surmises that as one side becomes more reliant on sophisticated electronics to conduct operations, a technologically-inferior adversary may compensate by developing a niche weapon that will neutralize electronic circuitry. Or, it may be that the electromagnetic pulses both sides are emitting are so numerous that they may neutralize each other. Should neutralization of the electromagnetic spectrum occur, then the advantage may swing to the side employing simpler ballistic weapons. "Since the ability of electronic blips to represent a military situation is inversely related to the latter's complexity, everything else being equal the risk is greater at sea than it is in the air, and it is greater on land than at sea, and in a guerrilla-type conflict it is greater than in a conventional one."[65]

Although the United States can exploit the concept of mass through its current technological edge, there is no certainty that other peer competitors will not arise, or even that potential competitors will necessarily follow the same path. "Different security requirements and objectives, strategic cultures, geostrategic postures, and economic situations will likely lead different competitors in different directions. . . . In a revolutionary epoch, long-term U.S. military dominance is not preordained."[66]

CONCLUSION

An examination of the principle of mass with respect to the RMA and information warfare reveals that the venerable concept is as valid to 21st century warfare as it was on the ancient Greek battlefield. The principle of mass is neither prosaic or static. It is a dynamic concept that has been reworked and applied anew with each generation of warfare. Today, fourth generation military thinkers with operational vision are once again recasting the principle as they search for ways to harness new technologies to combat power.

Mass has evolved from a concept of weighted concentration of brute force at a single point on the battlefield to its present definition which emphasizes the concentration of the effects of combat power at the decisive time and place to achieve the objective. Technology provides adversaries with the potential to develop niche weapons that may disrupt or deflect a combatant commander's efforts to concentrate the effects of combat power at a decisive point. To counteract this, the commander may achieve "mass" through the concept of dispersal. Whether Desert Storm is viewed as the final chapter of third generation warfare, or as the dawn of fourth generation warfare, the war provided an intimation of what will become the next iteration in the principle of mass. The melding of advanced technologies with new operational concepts makes possible synchronization, simultaneity, and depth. This allows the massed effects of dispersed combat power to be brought to bear against the enemy at numerous decisive points throughout the theater of operations. Subjected to nearly simultaneous, multi-dimensional strikes launched from energy focused from vastly separated sources, the enemy's command and control structure is overloaded, his decision cycle paralyzed, and his will to fight broken.

Mass is the vital element in achieving the objective, yet the ability to mass combat effects, in turn, is influenced and impacted by how effectively other principles of war are employed. Surprise allows the commander to shift the balance of his combat power in preparation to mass combat effects. The offense and maneuver allow the retention of initiative and promote the flexibility the commander needs to determine the decisive time and place to mass. Economy of force directs the enemy's attention away from the main effort, reduces his options, and delays him. Security reduces risk and preserves freedom of action. Unity of command and simplicity allows direction and orders to flow from a single commander in a clear and concise manner. Operational design is complex art, and massing the effects of combat power in a synchronized fashion lies at the heart of the endeavor. Proper application of the other principles of war facilitates this process.

In conventional war the principle of mass remains the arbiter on the battlefield. The task, then, is to ensure the space-based platforms and C4I nodes are protected in order that complex synchronization processes can be orchestrated. In unconventional warfare, which many of our future conflicts may devolve into, the application of mass remains a thorny problem. High-tech weaponry and conventional warfighting mentality are not readily adaptable to this environment. It is difficult to bring the massed effects of combat power to bear against an enemy who has no readily discernible military center of gravity, decisive points, or command and control structure. Restraint of combat power, not mass, will be the prevailing condition in this type of warfare, and precision strikes rather than overwhelming combat power will be the rule.

The RMA and information warfare have made it possible to incorporate the combination of synergy and simultaneity into the operational art. With that incorporation has come a fundamental change in the way we are able to apply the concept of mass at the strategic, operational, and tactical levels of warfare. Today's doctrine, however, will give way to tomorrow's thinking. Information technology is expected to increase a thousandfold in the next twenty years. As military commanders, thinkers, and planners, it is our job to visualize the possibilities and shape the concept of mass to that future vision.

NOTES

[1]U.S. Joint Chiefs of Staff, Joint Pub 3-0: Doctrine for Joint Operations (Washington, DC: U.S. Government Printing Office, 1 February 1995), A-1.

[2]Ibid.

[3]U.S. Joint Chiefs of Staff, Joint Pub 1: Joint Warfare of the Armed Forces of the United States (Washington, DC: U.S. Government Printing Office, 10 January 1995), III-1.

[4]C. R. Brown, "The Principles of War," United States Naval Proceedings 75, no. 6 (1949) 622.

[5]Joint Pub 3-0, A-1.

[6]Ibid.

[7]V. YE. Savkin, The Basic Principles of Operational Art and Tactics (A Soviet View), trans. under the auspices of The U.S. Air Force (Washington, DC: The U.S. Government Printing Office, n.d.), 203.

[8]Douglas A. MacGregor, "Future Battle: The Merging Levels of War," Parameters: U.S. Army War College Quarterly (Winter 1992-93) 43.

[9]Department of the Army, FM 100-5: Operations (Washington, DC: Headquarters, Dept. of the Army), 6-7.

[10]Ibid., 2-4, 2-5.

[11]Ibid., 2-8.

[12]Joint Pub 3-0, III-11.

[13]James J. Schneider, "The Loose Marble--and the Origins of Operational Art," Parameters: U.S. Army War College Quarterly 19, no. 1 (March 1989): 86.

[14]Ibid., 86-87.

[15]Martin van Creveld, Technology and War: From 2000 B.C. to the Present (New York: The Free Press, 1989), 1.

[16]Jeffrey R. Cooper, Another View of the Revolution in Military Affairs (Carlisle Barracks, PA: Strategic Studies Institute, 15 July 1994) 27.

[17]Ibid.

[18]Eric Paul Reed, "Power, Paradigms and Perspective: Framework of Opportunity in the Revolution in Military Affairs," Unpublished Research Paper, U.S. Army Command and General Staff College, Fort Leavenworth, KS: 1995, 12.

[19]Wyatt C. Cook, Information Warfare: A New Dimension in the Application of Air and Space Power (Alexandria, VA: Defense Technical Information Center, 1994), 4.

[20]Michael Moodie, The Dreadful Fury: Advanced Military Technology and the Atlantic Alliance (New York: Praeger, 1989), 48.

[21]Ibid., 42.

[22]Savkin, 201-2.

[23]Strategy and Force Planning Faculty, ed. Strategy and Force Planning, Chapt. 40, Excerpts from A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty-First Century," by Fredrick M. Franks, Jr. (Newport, RI: Naval War College Press, 1995), 531.

[24]Ibid., 541.

[25]MacGregor, 41-43.

[26]Cook, 4.

[27]Ibid.

[28]Ibid., 15.

[29]Cooper, 29-30.

[30]Joint Pub 3-0, III-15.

[31]Joint Pub 1, III-2.

[32]Stefan Eisen, Jr. "Netwar, It's Not Just for Hackers Anymore," Unpublished Research Paper, U.S. Naval War College, Newport, RI: 22 June1995.

[33]van Creveld, 235-7.

[34]Kenneth L. Adelman and Norman R. Augustine, The Defense Revolution: Strategy for the Brave New World by an Arms Controller and an Arms Builder (San Francisco: ICS Press, 1990), 71.

[35]Eisen, 5.

[36]Thomas Moorman, "The 'Space' Component of 'Aerospace,'" Comparative Strategy 12, no. 3 (July-September 1993): 251.

[37]Edward F. Teigeler, The Principles of Mass and Maneuver Applied to Space Operations (Alexandria, VA: Defense Technical Information Center, 1989), 19.

[38]Strategy and Force Planning Faculty, ed. Strategy and Force Planning, Chapt. 33, Excerpts from War and Anti-War: Survival at the Dawn of the 21st Century, by Alvin and Heidi Toffler (Newport, RI: Naval War College Press, 1995), 428-30.

[39]Ibid., 30.

[40]Earl H. Tilford, Jr. The Revolution in Military Affairs: Prospects and Cautions (Carlisle Barracks, PA: Strategic Studies Institute, 23 June 1995), 1.

[41]Robert J. Bunker, "The Transition to Fourth Epoch War," Marine Corps Gazette 78, no. 2 (September 1994): 35.

[42]Joint Pub 3-0, III-9.

[43]Tilford, 5.

[44]The United States Marine Corps Concepts and Issues '95: A Certain Force... (Washington, DC: Headquarters, U.S. Marine Corps, 1995), 1-2.

[45]Toward the Future: Global Reach, Global Power (Washington, DC: Dept. of the Air Force, 1993), 9.

[46]MacGregor, 42.

[47]Robert J. Bunker, 29.

[48]MacGregor, 41-42.

[49]Col. Thomas Harkins, USMC, interview by author, 6 October 1995, Quantico, VA/Newport, RI, telephone interview, Naval War College, Newport, RI.

[50]Strategy and Force Planning Faculty, 536.

[51]Ibid., 537.

[52]Ibid., 532.

[53]Ibid.

[54]van Creveld, 290.

[55]Strategy and Force Planning Faculty, 534.

[56]Ibid., 535.

[57]Steven Metz and James Kievit, Strategy and the Revolution in Military Affairs: From Theory to Policy (Carlisle Barracks, PA: Strategic Studies Institute, 1995), 19-20.

[58]Michael J. Mazarr, The Revolution in Military Affairs: A Framework for Defense Planning (Carlisle Barracks, PA: Strategic Studies Institute, 1994), 11.

[59]Ibid., 12.

[60]James R. Wolf, "Implications of Space-Based Observation," Military Review (April 1994): 82.

[61]Ibid., 84.

[62]Strategy and Force Planning Faculty, 535.

[63]Joint Pub 3-0, III-11.

[64]van Creveld, 279.

[65]Ibid., 282.

[66]Strategy and Force Planning Faculty, ed. Strategy and Force Planning, Chapt. 44, Cavalry to Computer: The Pattern of Military Revolutions, by Andrew J. Krepinevich (Newport, RI: Naval War College Press, 1995), 596.

SELECTED BIBLIOGRAPHY

Adelman, Kenneth L. and Norman R. Augustine. The Defense Revolution: Strategy for the Brave New World by an Arms Controller and an Arms Builder. San Francisco: ICS Press, 1990.

Bowen, Joseph C. Military Movements and the Principles of War. Carlisle Barracks, PA: U.S. Army War College, 1992.

Brown, C. R. "The Principles of War." United States Naval Proceedings 75, no. 6 (1949): 621-33.

Bunker, Robert J. "The Transition to Fourth Epoch War." Marine Corps Gazette 78 no. 2 (September 1994): 20-32.

Clausewitz, Carl von. Principles of War. Translated and edited by Hans W. Gatzke. Harrisburg, PA: The Military Service Publishing Co., 1948.

Cook, Wyatt C. Information Warfare: A New Dimension in the Application of Air and Space Power. Alexandria, VA: Defense Technical Information Center, 1994.

Cooper, Jeffrey R. Another View of the Revolution in Military Affairs. Carlisle Barracks, PA: Strategic Studies Institute, 15 July 1994.

Eisen, Stefan, Jr. "Netwar, It's Not Just for Hackers Anymore." Unpublished Research Paper, U.S. Naval War College, Newport, RI: 22 June 1995.

Harkins, Thomas, Col., USMC. Interview by author, 6 October 1995. Quantico, VA/Newport, RI. Telephone interview. Naval War College, Newport, RI.

Headquarters, Department of the Army. FM 100-5 Operations. Washington, DC: Department of the Army, 14 June 1993.

MacGregor, Douglas A. "Future Battle: The Merging Levels of War." Parameters: U.S. Army War College Quarterly (Winter 1992-93): 33-47.

Mazarr, Michael J. The Revolution in Military Affairs: A Framework for Defense Planning. Carlisle Barracks, PA: Strategic Studies Institute, 10 June 1994.

Metz, Steven and James Kievit: Strategy and the Revolution in Military Affairs: From Theory to Policy. Carlisle Barracks, PA: Strategic Studies Institute, 27 June 1995.

Moody, Michael. The Dreadful Fury: Advanced Military Technology and the Atlantic Alliance. New York: Praeger, 1989.

Moorman, Thomas. "The 'Space' Component of 'Aerospace.'" Comparative Strategy 12, no. 3 (July-September 1993): 251-255.

Reed, Eric Paul. "Power, Paradigms and Perspective: Framework of Opportunity in the Revolution in Military Affairs." Unpublished Research Paper. U.S. Army Command and General Staff College, Fort Leavenworth, KS, 1995.

Savkin, V. YE. The Basic Principles of Operational Art and Tactics (A Soviet View). Translated under the auspices of The U.S. Air Force. Washington, DC: The U.S. Government Printing Office, n.d.

Schneider, James J. "The Loose Marble--and the Origins of Operational Art." Parameters: U.S. Army War College Quarterly 19, no.1 (March 1989): 85-99.

Strategy and Force Planning Faculty, ed. Strategy and Force Planning. Chapt. 33. Excerpts from War and Anti-War: Survival at the Dawn of the 21st Century, by Alvin and Heidi Toffler. Newport, RI: Naval War College Press, 1995.

_____. Strategy and Force Planning. Chapt. 40. Excerpts from a Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty-first Century, by Fredrick M. Franks, Jr. Newport, RI: Naval War College Press, 1995.

_____. Strategy and Force Planning. Chapt. 44. Cavalry to Computer: The Pattern of Military Revolutions, by Andrew F. Krepinevich. Newport, RI: Naval War College Press, 1995.

Teigeler, Edward F., III. The Principles of Mass and Maneuver Applied to Space Operations. Maxwell AFB, AL: Air Command and Staff College Air University, 15 June 1988.

Tilford, Earl H., Jr. The Revolution in Military Affairs: Prospects and Cautions. Carlisle Barracks, PA: Strategic Studies Institute, 23 June 1995.

Toward the Future: Global Reach, Global Power. Washington, DC: Dept. of the Air Force, 1993.

U.S. Joint Chiefs of Staff: Joint Pub 1: Joint Warfare of the Armed Forces of the United States. Washington, DC: U.S. Government Printing Office, 10 January 1995.

_____. Joint Pub 3-0: Doctrine for Joint Operations. Washington, DC: U.S. Government Printing Office, 1 February 1995.

U.S. Marine Corps. Concepts & Issues '95: A Certain Force.... Washington, DC: Headquarters, U.S. Marine Corps, 1995.

van Creveld, Martin. Technology and War From 2000 B.C. to the Present. New York: The Free Press, 1989.

Wolf, James R. "Implications of Space-Based Observation." Military Review (April 1994): 75-85.